



# High energy storage effect

Ultrafast charge/discharge process and ultrahigh power density enable dielectrics essential components in modern electrical and electronic devices, especially in pulse power systems. However, in recent years, the energy storage performances of present dielectrics are increasingly unable to satisfy the growing demand for miniaturization and ...

Mg-based alloys are good candidates for solid-state hydrogen storage because of their high hydrogen storage density and abundant resource. Meanwhile, Mg-RE-TM alloys have ...

Guo, M. et al. High-energy-density ferroelectric polymer nanocomposites for capacitive energy storage: enhanced breakdown strength and improved discharge efficiency. *Mater. Today* 29, 49-67 (2019).

the energy storage in BT<sub>Sn</sub> ceramic with  $x = 0.105$  and found that the dielectric constant and the high energy storage density reached 54000 and 30 mJ/cm<sup>3</sup> at 10 kV/cm, respectively. It is worth to mention that the evaluation of the EC effect by indirect method following Maxwell relation is ...

The effect of  $E_g$  on the breakdown strength is discussed in these studies, which also inspires the design concepts of high-breakdown energy storage ceramics. Interestingly, a high  $E_g$  and small grain size are the keys to achieving a high  $E_b$ ; however, a high  $P_{max}$  may be related to the NN-induced micro-phase structure transition, which ...

Environmentally friendly energy storage materials with high energy storage performance and excellent stability for applications in pulse power systems are urgently ...

High dielectric constant, maximal polarization, small remnant polarization, and high breakdown strength are required to achieve high energy storage in ferroelectric ...

BaTiO<sub>3</sub> ceramics are difficult to withstand high electric fields, so the energy storage density is relatively low, inhabiting their applications for miniaturized and lightweight power electronic devices. To address this issue, we added Sr<sub>0.7</sub>Bi<sub>0.2</sub>TiO<sub>3</sub> (SBT) into BaTiO<sub>3</sub> (BT) to destroy the long-range ferroelectric domains. Ca<sup>2+</sup> was introduced into BT-SBT in the ...

Here we report record-high electrostatic energy storage density (ESD) and power density, to our knowledge, in HfO<sub>2</sub>-ZrO<sub>2</sub>-based thin film microcapacitors integrated into ...

Achieving high energy storage performance and ultrafast discharge speed in SrTiO<sub>3</sub>-based ceramics via a synergistic effect of chemical modification and defect chemistry *Chem. Eng. J.*, 429 (2022), Article 132548, 10.1016/j.cej.2021.132548

The great improvement of energy storage performance at high-temperature benefits from the blocking effect



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of the ordered second phases on delaying and hindering the propagation of the breakdown ...

Dielectric energy storage capacitors with excellent high temperature resistance are essential in fields such as aerospace and pulse power. However, common high-temperature resistant polymers such as ...

The BCZT ceramic showed a large recovered energy density ( $W_{rec}$ ) of  $414.1 \text{ mJ cm}^{-3}$  at 380 K, with an energy efficiency of 78.6%, and high thermal-stability of  $W_{rec}$  of 3.9% in the temperature range of 340-400 K. The electrocaloric effect in BCZT was explored via an indirect approach following the Maxwell relation at  $60 \text{ kV cm}^{-1}$ .

Chen et al. investigated the energy storage mechanism of  $(\text{Ni}_{0.2} \text{Co}_{0.2} \text{Mn}_{0.2} \text{Fe}_{0.2} \text{Ti}_{0.2})_3 \text{O}_4$  (NCMFT) in (LIBs) ... The unique hysteresis diffusion effect of high-entropy materials can slow down the agglomeration of secondary particles during cycling, which is conducive to improving the structural stability and integrity of electrode ...

In the past three decades, lithium-ion battery (LIB) with higher energy density, wider operating temperature range and high safety has been permanently pursued to meet the rising demand of long-range electric vehicles and grid-scale energy storage systems [1], [2], [3]. The electrolyte is a key component that determines the temperature adaptability and safety ...

Synergistic effect of multi-phase and multi-domain structures induced high energy storage performances under low electric fields in  $\text{Na}_{0.5} \text{Bi}_{0.5} \text{TiO}_3$ -based lead-free ceramics Chem. Eng. J., 472 ( 2023 ), pp. 144973 - 144995

1 Introduction. Lithium-ion batteries (LIBs) have long been considered as an efficient energy storage system on the basis of their energy density, power density, reliability, and stability, which have occupied an irreplaceable position in the study of many fields over the past decades. [] Lithium-ion batteries have been extensively applied in portable electronic devices and will play ...

Developing lead-free dielectric ceramics with outstanding energy storage properties has become urgent for dielectric capacitors. Herein, a synergistic effect design strategy has been proposed that combined the merits of relaxor ferroelectrics with high polarization/low remanent polarization and enhanced linear materials with relatively high polarization/ultrahigh ...

The KNN-H ceramic exhibits excellent comprehensive energy storage properties with giant  $W_{rec}$ , ultrahigh  $i$ , large  $H_v$ , good temperature/frequency/cycling stability, and ...

Many applications of HEAs were reported in the energy sector, including electrochemical energy storage and conversion and hydrogen storage. Yeh et al. 58 summarized four core effects of HEAs: (1) high-entropy effects, (2) lattice distortions, (3) sluggish diffusion and (4) cocktail effects. These factors provide HEAs with numerous versatile ...



# High energy storage effect

In the context of the global call to reduce carbon emissions, renewable energy sources such as wind and solar will replace fossil fuels as the main source of energy supply in the future [1, 2]. However, the inherent discontinuity and volatility of renewable energy sources limit their ability to make a steady supply of energy [3]. Thermal energy storage (TES) emerges as ...

a large maximum polarization ( $P_m$ ), a small remnant polarization ( $P_r$ ), and a high breakdown electric field ( $E_b$ ) is essential for attaining a substantial density of recoverable energy storage ( $W$  ...

The electrostrictive effect and energy storage performance of high  $\text{Pr}^{3+}$  doping concentration (1.4–2 mol%) samples were studied. The origin of giant electrostrictive coefficient and excellent energy-storage performance in PIN-PMN-PT:Pr<sup>3+</sup> ceramics are discussed and the enhancement mechanism of Pr<sup>3+</sup> doping is proposed.

energy evolution, tension bolts, UDEC, differential analysis, rock Author for correspondence: Xiangyu Wang e-mail: wangxiangyu\_cumt@163 +Present address: Nanhu campus, China University of Mining and Technology, No.1, University Road, Xuzhou City, Jiangsu Province, China. An investigation on the effect of high energy storage anchor

The miniaturization and high integration of electronic devices pose new requirements for the energy storage density and high-temperature performance of dielectric ...

Relaxor ferroelectrics are the primary candidates for high-performance energy storage dielectric capacitors. ... Y. et al. Dielectric properties and electrocaloric effect of high-entropy ( $\text{Na}_{0.2}$  ...

Na superionic conductor (NASICON)-type  $\text{Na}_4\text{MnCr}(\text{PO}_4)_3$  has attracted extensive attention among the phosphate sodium-storage cathodes due to its ultra-high energy density originating from three-electron reactions ...

1 &#0183; Here, a high-entropy  $\text{La}_{1/4}\text{Ce}_{1/4}\text{Pr}_{1/4}\text{Nd}_{1/4}\text{Nb}_3\text{O}_9$  (HE- $\text{LaNb}_3\text{O}_9$ ) oxide is prepared through multiple rare-metal-ion substitution in  $\text{LaNb}_3\text{O}_9$ , and uses HE- $\text{LaNb}_3\text{O}_9$  ...

Apart for solar energy storage, the double-effect CATB is also promising for geothermal energy storage and waste energy storage. ... A hybrid compression-assisted absorption thermal battery with high energy storage density/efficiency and low charging temperature. Appl. Energy, 282 (2021), Article 116068.

Yang, M. et al. Quantum size effect to induce colossal high-temperature energy storage density and efficiency in polymer/inorganic cluster composites. Adv. Mater. 35, 2301936 (2023).

Energy management strategy is the essential approach for achieving high energy utilization efficiency of triboelectric nanogenerators (TENGs) due to their ultra-high intrinsic impedance. However ...



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